PRESIDENTIAL ADDRESS

ON

THE SPONTANEOUS HEALING OF TUBERCULOSIS: ITS FREQUENCY AND THE MODE OF ITS OCCURRENCE.

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By JOSEPH COATS, M.D.,

Lecturer on Pathology and Pathologist to the Glasgow Western Infirmary.

I HAVE chosen as the subject of my remarks a phase of the important subject of tuberculosis. The importance of this disease in its various forms can scarcely be overestimated. I believe it to be the most frequent and fatal of all the diseases that mankind is liable to.

I. THE PREVALENCE OF TUBERCULOSIS.

In a recent communication to the Sanitary Association of Scotland I endeavoured to form an estimate of the frequency of tuberculosis in the community. Let me briefly rehearse the reasons which induced me to conclude that of all the persons born into the world about one-half are fated before they die to be affected with tuberculosis in one or other of its forms.

The number of deaths assigned to tuberculosis in the Registrar-General's Reports does not represent the real prevalence of the disease. Of the whole deaths in Scotland, about 15 per cent. are assigned to tuberculosis. I believe this percentage to be considerably too low, at least in the case of children. If we accept the figures as approximately giving the proportion of deaths from tuberculosis in adults, we have still to make an important correction for children. A great many deaths amongst children are not certified, and these must frequently be wrongly assigned. Then there are many deaths referred to measles, whooping-cough, bronchitis, convulsions, etc., which are really due to tuberculosis. If we take the statistics of children's hospitals and examine into the cases of death, we find that at least a third of the cases, and frequently a larger proportion, are referred to tuberculosis. These are the results amongst the working-class community when the diagnosis is made by specially skilled persons, generally corrected by *post-mortem* examination. In our own Glasgow Hospital for Sick Children the percentage for 1889 was 45, and for 1890 34.7 per cent., and this is about the ordinary range. And yet the Registrar-General, in his report for 1888, gives only 10.6 as the percentage of deaths due to tuberculosis of the whole deaths under 10 years of age. There must be a very serious error here, and, if the statistics of children's hospitals are at all to be relied on, then we must greatly raise this proportion. If we take a third of the deaths in children as due to tuberculosis, and accept the Registrar-General's returns for persons above 10 years of age, then we have about 23 per cent. of the total deaths at all ages due to tuberculosis.

But we have still to consider the recoveries. There are in children the very frequent scrofulous or, more correctly, tuberculous lymphatic glands; there is lupus and there are diseases of bones, all of which must furnish a large contingent of cases of tuberculosis not fatal to life. But even among the more deadly forms of internal tuberculosis, such as that of the lungs and peritoneum, there is a considerable percentage of recoveries. As this is more particularly my topic to-night, I need only say in the meantime that, as the result of the careful scrutiny of *post-mortem* examinations, I have come to the conclusion that about 23 per cent. of the persons who die of diseases unconnected with tuberculosis have been at a former period of life affected with some form

of internal tuberculosis. If we take only these into account, excluding the cases of healed external tuberculosis, then we get with the former percentage of 23 a proportion of 45 per cent. of persons who either die of tuberculosis or show evidence at the time of death of having been affected. Surely if we take into account the cases of external tuberculosis we shall not be far from the truth in saying that about half the persons born into the world are at some period of their lives affected with tuberculosis.

II. THE IMMEDIATE RESULTS OF TUBERCULOUS INFECTION.

In considering more particularly the healing of tuberculosis, I think it may be well to say something as to the processes which go on before and after the healing has begun. There are surely now very few who deny the existence of the tubercle bacillus and its potency in the production of disease. We know that this microbe is of very slow growth, and that in its growth, either outside the body or inside, it produces one or more chemical principles of extraordinary virulence. Koch has obtained from cultures of the tubercle bacillus a glycerine extract of these substances, the so-called tuberculin. This substance, in a dose equal only to the $\frac{1}{1000}$ of a grain of the essential principle, which is the amount in a milligramme of Koch's fluid, will produce in a tuberculous person an acute swelling of the tuberculous part with considerable fever.

When tubercle bacilli find their way into the living tissues of an animal, they in themselves are simply so many minute pieces of matter of no consequence. The irritant which they produce acts on the tissues leading to various changes in the elements, which have been very carefully studied experimentally by Baumgarten. The cells of the part enlarge and their nuclei divide, so that some of them come to contain many nuclei, the so-called giant cells. If the irritant be very abundantly produced, that is, if the bacilli are growing vigorously, then we may have somewhat violent inflammatory and other phenomena produced. One of the most important of the phenomena occurring in tuberculosis is local death, or necrosis of the parts affected. This mostly takes the form of caseation or caseous necrosis, although a more ordinary sloughing is not very uncommon. In most cases of tuberculosis there is, therefore, a death of tissue, and the dead tissue has to be disposed of, being usually spit up in the case of phthisis pulmonalis, so as to lead to the formation of cavities. These are facts familiar to all of you, but it was necessary to remind you of them on account of what is to follow.

III. DIFFERENCES OF CONSTITUTIONAL SUSCEPTIBILITY.

The processes which I have indicated occur with more or less acuteness when the bacillus obtains a foothold in the living body, but there must be many persons in whom it is incapable of taking hold. There is, as I believe, an exaggerated tendency to ascribe everything to the bacillus and nothing to the predisposition of the person. In an article by Professor Tyndall² the infectiousness of tuberculosis is strongly insisted on. According to the views of Cornet, whose work Tyndall has under notice, the whole pathology of tuberculosis is contained in the microbe and its effects. My belief is that whilst the bodies of children are exceedingly susceptible to tuberculosis, and when they are exposed to the infection they are very liable to incur the disease, yet in adults there are the most diverse degrees of resistance. The fact that phthisis pulmonalis occurs in the vast majority of cases in young adults shows that, as one of the various elements, the time of life has an important bearing on the resistibility of the body. It is this resistibility which is properly to be regarded as constitutional.

In considering what happens when the bacilli find their way into the tissues of a non-susceptible person, we are greatly assisted by some important observations by Metschnikoff. He experimented on a small animal of the marmot kind, which is little susceptible to tuberculosis. When cultures of the bacillus were inoculated in this animal, and the animal was killed weeks or months afterwards, the appearances were such as are figured in the diagram given in a paper by Metschnikoff.³ It will be understood that, by the

¹ This being the Presidential Address was not discussed at the meeting. It has been arranged, however, at the request of a number of members, to hold a discussion on the subject on November 6th.

² *Fortnightly Review*, September, 1891.

³ *Virchow's Archiv*, cxiii.

method of preparation used, the tubercle bacilli in their unchanged condition are stained of a bright red colour, while other structures are coloured blue. I may add that, having seen Metschnikoff's preparations in Paris, I am able to vouch for the accuracy of his drawings.

We see at first that well formed and stained bacilli are contained in cells, some of which show signs of dividing. In one there are two bacilli which have swollen up and show a central part almost free of colour. Here is the beginning of a change. All these cells have single nuclei, being the so-called epithelioid cells. In the multi-nucleated or giant cells the changes in the bacilli are much more manifest. Here they swell up, and some of them lose their power of retaining their red colour and get stained blue. Then later on the swollen bacilli are converted into yellow masses, and lastly into yellow clumps. This is the process of intracellular digestion. From these observations we may gather that, when the bacilli are introduced into an animal possessing sufficient powers of resistance, the bacilli are seized by the cells and there is a struggle between the two. In this case the cells overcome the bacilli, and the latter die and degenerate.

In the case of an animal which is susceptible the balance turns the opposite way. In rabbits Metschnikoff was able to demonstrate that, while in some giant cells the same changes in the enclosed bacilli are visible as we have seen in the marmot, yet for the most part it is the cells which succumb and undergo caseous necrosis. We may infer that, in human beings, similar processes occur and that the struggle between bacilli and cells is a continuous one. In some persons the bacilli are always overcome, in some the contest is doubtful, whilst in others the living cells continually prove the weaker. We have to add to this a fourth class in which, after the disease has been fully established and has already done much damage, there is so far a recovery in that the infection ceases and is removed, leaving Nature to repair the damage so far as it is in its power. It is this last group of cases which I desire to-night more especially to describe and illustrate.

IV. PROCESSES INVOLVED IN HEALING OF TUBERCULOSIS.

Let us consider what occurs when a patient recovers from phthisis pulmonalis. The question may occur to you, Can a person recover from a well-established tuberculosis of the lungs? My answer will be given in actual figures further on, but I may here show, as a sufficiently categorical reply to the question, a preparation which I have already brought before another Society. It is a lung which no longer contains any lung tissue, but is simply a congeries of cavities. There is one large cavity extending from apex to base in the anterior parts of the lung, with only a partial partition indicating the division of the lobes. In communication with this cavity are three others of considerable dimensions, and behind these there is another cavity. These cavities have the general configuration of those so commonly met with in phthisis pulmonalis, showing partial partitions and bridges of tissue spanning them. The cavities also communicate with bronchial tubes as phthisical cavities do. The lung was firmly adherent to the chest wall, as is customary in phthisis. But if you look at the walls of these cavities you will see a very great contrast to what is the rule in active tuberculosis of the lung. Contrast the characteristics of the cavities with those in this other lung, for instance. In the one the cavities are lined with a smooth well-formed connective tissue which does not show a trace of that caseous necrosis, or ulceration, or softening which you see in all cases of active phthisis and which you see so prominently in this other preparation. In one the wall is a wholesome fibrous membrane, in the other the cavity has an irregular ulcerated surface with curdy material frequently adherent and softening going on actively. In this latter case the cavity is almost equally large—so large as to have suggested during life the idea of pneumothorax.

The cavities in the lung first shown are typically healed cavities: there is not a trace of active tuberculosis visible. The opposite lung in this case showed evidences of a less advanced tuberculosis which had also undergone healing. There were cicatrices in the apical parts and some cretaceous matter in the midst of them.

These are the pathological evidences of a healed phthisis.

The clinical evidences are almost equally interesting. The lungs were those of a man who died at the age of 30 years. Four years and a half before death he was affected with an acute phthisis with high fever, for which he was treated in the Royal and Western Infirmarys. He improved somewhat, and after he left the infirmarys he remained idle for about eighteen months, when he began to recover decidedly. He improved so much that he was able to go back to work, and he worked for more than two years, feeling fairly well. A few weeks before death he had febrile attacks with rigors, and he was readmitted to the Western Infirmary. He expectorated large quantities of a material like watery gruel in which no tubercle bacilli could be found, although a large cavity was readily enough detected. A lobular pneumonia was found after death to be the cause of these symptoms. The remaining part of the less affected lung presented areas of condensation, with fibrinous exudation in the lung alveoli and bronchi such as one finds in ordinary acute pneumonia. My belief is that the large surfaces of the cavities may have furnished the abundant watery expectoration, and that some of this, passing into the bronchi of the other lung and decomposing, had set up the acute inflammation. The lobular character of this inflammation indicated an origin from the finer bronchial tubes.

The mode of healing of tuberculosis is to some extent illustrated by the specimen which I have shown, but I will now go more particularly into the subject. I may, perhaps, give a better idea of the process of healing if I describe what occurs in the case of tuberculous lymphatic glands.

The lymphatic glands of the neck are peculiarly liable to tuberculosis. As the process advances the gland becomes more and more involved. The irritant present in the gland induces the aggregation of inflammatory products and true typical tubercles, and these undergo caseous necrosis. It is interesting to note that this tuberculous process is limited by the capsule of the gland. There are apparently no channels through the capsule by which the bacilli may advance. On the other hand these advance by the lymphatic vessels which communicate with other glands, and so you are apt to have many glands in turn involved. When the whole of a gland has been involved, what you have is a mass considerably larger than the original gland, in which there is no longer any gland tissue detectable. The whole is a homogeneous caseous mass, which on section has a considerable resemblance to the section of a raw potato. You are to understand that this is really a mass of dead matter, in which living bacilli are still contained. This dead mass may remain long unaltered, but usually, especially if the position be a superficial one, some suppuration occurs around it, and the caseous matter softens. An abscess forms and the dead matter and pus are discharged. The infective virus is to a large extent cleared out along with the dead matter, but very often this is not completely the case, and so a tuberculosis frequently lingers on, in the wound and sinus, to be gradually overcome in the course of months or years. You are also aware how much the process may be accelerated by the surgeon scooping out the entire contents and removing all infectious matter with a Volkmann's spoon. This is the usual course of events, then, in tuberculous glands in the neck. The necrosed infective matter is emptied out and, a clean wound being left, there is closure by cicatrization in the usual way.

If we take the case of a mesenteric gland, we shall observe a variation in this procedure. Here the tuberculosis generally advances, as in the other case, till the whole gland is affected, and it is converted into a necrosed mass resembling a raw potato. When this has occurred it is seldom that any suppuration or softening ensues. Probably this is from the protected position of the glands deep in the abdomen. The necrosed caseous mass simply remains as a foreign substance in the midst of the tissue. In the course of time lime salts are deposited in it, and the mass becomes converted into a putty-like matter, or latterly into a hard stony mass. It is quite common to meet with such hard masses, sometimes of considerable size, in the mesentery—evidences of the existence of a tuberculosis, probably in early life, but now completely extinct.

In looking at the process of healing in the various organs of the body we shall find one or both of these methods illus-

trated. We shall find, that is to say, evidences of necrosis either in the form of retained pultaceous, chalky, or stony masses, or else we shall find gaps generally represented by cavities or cicatrices. In both cases there is frequently considerable shrinking and puckering, due to cicatricial contraction in the new-formed inflammatory tissue around the old lesion.

V. HEALED TUBERCULOSIS IN VARIOUS ORGANS.

The Lungs.—In the case of the lungs, which, as they are the most frequent seat of tuberculosis, are also the most frequent seat of healing, we find both of these forms of recovery. I have already shown you a lung in which a congeries of cavities represents the whole lung, which had been emptied of its tissue in an attack of acute tuberculosis. The opposite lung in this case showed the other form of healing. It contained in the upper lobe cicatrices, in the midst of which some chalky or cretaceous matter was present. This latter is the more frequent condition in the lung, and is, as we shall see afterwards, very often met with on *post-mortem* examination. Along with one or other of these forms we meet with adhesion of the pleura, such as one commonly finds in tuberculosis during its active stage.

The Bones.—In tuberculosis of bone the process of necrosis involves the bony tissue, and renders it much less resistant to mechanical force. Hence the bone affected usually gets ground down, crushed, or eaten into. This is the state of matters in ordinary caries. In disease of the vertebræ there may be a similar grinding down. This is well shown in this preparation, and still better in the water-colour sketch made of it in the fresh state before the parts were discolored by preservation in alcohol. The extent of the necrosis is visible here by the white colour due to the caseous condition which has affected the cancellated bone. As the preparation is a longitudinal section, it can be seen that the upper of the two bodies affected, which is the second lumbar, is comparatively little involved, whilst the lower is affected almost through its entire thickness. The intervertebral disc is destroyed, and there is some erosion of the vertebra, but comparatively little.

When this disease has advanced far, so as to cause necrosis of the greater part of one or more of the bodies, then there is apt to be more serious destruction of the bone. This is well shown in the next preparation (No. 28A). Here, again, we have the vertebræ sawn longitudinally, and showing tuberculosis in two bodies. The substance of these bodies was occupied by yellow caseous matter. The two bodies have become crushed together so as to produce a broken-down portion which looks like a fracture through the vertebræ. In the midst of this crushed part there is an elongated piece of white tissue, which is the remains of the intervertebral disc. With this crushing there is considerable shortening, so that the two vertebræ measure about one inch from above downwards, as compared with an inch and three-quarters in the two vertebræ above. This crushing has caused the necrosed tissue to be projected outwards from the position of the bodies. Some of it is considerably dislocated backwards so as to impinge upon the spinal canal, as can be seen in the preparation. With the collapse of the vertebræ there would also be some curvature of the spine, and the two together had so interfered with the spinal cord as to induce complete paralysis before death.

These preparations show the mechanism by which Pott's curvature of the spine is produced, the necrosed bodies giving way and so giving rise to collapse anteriorly, and a sharp angular curvature with the apex backwards. There is always in these cases more or less of an abscess formation, and the necrosed tissue is gradually removed, and may be finally discharged at the surface of the body. But now, even in such a state of matters, healing may take place. The necrosed tissue may be disposed of, and a healthy granulating cavity may form which ultimately unites and forms mature tissue. The gap is, of course, never filled up, but you have the curvature stereotyped and the bones reunited by new formed tissue. The new tissue formed is largely true bone, and so you have an ankylosis of the parts in the new position.

There is a remarkable example of this in the next preparation which I will show. It is the lateral half of the cervical vertebræ sawn longitudinally. It is seen that the anterior portions of the third and fourth, and, to a certain extent, of

the second vertebræ, are atrophied, the section of the second especially being in the form of a wedge, the thin end of which is directed forwards. This atrophy has caused a deep concavity in the anterior aspect of the vertebræ, but this concavity is partly occupied by a piece of dense bone which is new-formed, and constitutes a kind of support instead of the lost parts of the bodies. This piece of dense bone is in immediate connection with the body of the fourth vertebra, but is separated from the third by a layer of fibrous tissue. With the concavity in front there corresponds a marked convexity behind, with an extreme narrowing of the spinal canal. The point of greatest constriction is near the upper extremity of the third vertebra, where the total diameter from before backwards is about a quarter of an inch, the lateral diameter being retained at its usual extent.

The history of this case is very interesting. It does not seem as if the abscess, which we may presume to have formed, ever came to the surface; that, too, seems to have been absorbed. During adolescence there was a swelling in the neck, noticed as such by his father and ascribed to stooping at work. He enlisted in the army at the age of 18 and served for seventeen years. He was discharged at the age of 35, presumably on account of incipient paralytic symptoms. He was admitted to the Western Infirmary four years afterwards in an insensible condition, apparently from drink. When he recovered it was found that there was paralysis of the arms, and to a less extent of the legs. Death was due to paralysis of respiration. The remarkable fact will be noticed here that though the primary disease was during adolescence (and we must suppose that the curvature took place then), yet the spinal cord had managed to accommodate itself to the diminished space for many years. It is difficult to understand why after at least seventeen years there should have been the beginnings of an interference, and then this sudden interruption of the cord. It may be that the natural changes which occur in the vertebral column as life advances may have taken away the small margin of space which the curvature had left.

Another preparation shows at least a partial healing of a much greater degree of disease than the last (IA., No. 25). If you examine this preparation closely you will see that the bodies of two vertebræ have completely disappeared, and that the arches of these two vertebræ have coalesced, so as to form a somewhat solid ring. The spinous processes of these vertebræ are also firmly ankylosed. In consequence of the collapse of the two vertebræ, the bodies of those above and below have come in contact and have become ankylosed together. You will notice that the ankylosis of the spinous processes has helped to preserve the spinal cord from injury, for although there is here a marked curvature yet there is no sharp or acute bend, the spines having an arched shape. In this connection it is to be noted that although the case was very carefully investigated in the wards of the Western Infirmary, and a long record was written in regard to it, yet there is no mention of any suspicion of spinal disease. The symptoms were those of tuberculous meningitis, and in this connection the state of the legs was noticed, and it is specifically remarked that "he could draw both legs up, and does so when the soles are tickled. Knee-jerks are normal; no ankle clonus."

The Kidneys.—If we turn now to the kidneys we may inquire whether anything like a true healing of tuberculosis ever occurs there. I confess that to my mind this question has been doubtful. Let us consider the progress of events in tuberculosis of the kidney. The disease mostly begins in the pelvis by a tuberculosis of the apical part of a pyramid where it projects into its calyx. There is the usual caseous necrosis leading to the formation of a ragged ulcer. It seems to me that the soft parenchyma of the kidney forms a favourable structure for the advance of the tuberculous process. This eats into the tissue, forming as the disease advances ragged cavities, in the walls of which some remains of the caseous matter is usually visible. Such a condition is visible in another preparation (VI, 20). Here the kidney is considerably enlarged in outline, and the section shows a number of irregular cavities which are in communication with the pelvis. These cavities are lined with a rough yellow layer of caseous matter. The ureter is also involved. It is greatly thickened and is lined throughout with a consistent opaque layer.

Now it is quite conceivable that through time the whole kidney might be used up by the tuberculosis, just as a lymphatic gland may be completely affected. The kidney has a discharging duct, and the necrosed contents are carried off with the urine. The whole kidney may thus be emptied out and come to be represented by an irregular cavity. It is nearly so in the preparation which I have shown. It will be noted also that the tuberculosis is confined by the capsule of the kidney just as it is by the capsule of the lymphatic gland. It is conceivable therefore that, after the whole kidney has been destroyed and replaced by a large cavity, the disease may take pause and healing occur. I believe that an approach to this has occurred in the kidney which I now show you (new preparation). Here there is virtually no kidney tissue remaining, and the internal surface of the cavity presents little of the rough appearance ordinarily met with in tuberculosis. The appearance approaches more to that in hydronephrosis or pyonephrosis. As a matter of fact this kidney contained creamy pus and not the curdy *débris* and urine that we usually find in the tuberculous kidney. I believe this kidney to be on the way towards healing. That the disease is tuberculous is proclaimed by the very obvious tuberculosis of the ureter. There is, as in the other case shown, the thickening and the layer of caseous matter lining it.

There is a condition of kidney occasionally met with which has always to me been somewhat doubtful in its pathology, a condition represented in another preparation (VI, 17). It consists of a number of cavities filled with pultaceous matter. These cavities are closed and the pelvis of the kidney is abolished. There is no remnant of kidney tissue, the organ being represented by the closed cavities filled with pultaceous matter, which is obviously the remains of partially dried-in pus. This condition results from pyonephrosis, and is undoubtedly in most cases the consequence of a suppurative inflammation of the pelvis of the kidney associated with an obstruction to the outflow of the urine. While I take this to be the usual origin, I think it quite possible that in some cases the condition may follow tuberculosis of the kidney. At any rate, the specimen which I have just shown you might readily pass into the condition of the preparation last shown.

A favourable issue to tuberculosis of the kidney is, I believe, excessively rare. There are various circumstances which interfere with it. The most important of these is the readiness with which the disease extends. Tuberculosis of the kidney is often associated with a widespread tuberculosis of the urino-genital tract. Thus, in the case just referred to there were evidences of old or recent tuberculosis of the testicle, vas deferens, vesiculæ seminales, and the other kidney. The infection, if it begins in the kidney, is liable to extend down the ureter to the bladder, and is liable after a time to spread up the other ureter to the kidney. It will often extend also to the genital tract from the neck of the bladder. The usual condition that one meets with is an advanced tuberculosis of one kidney with a slighter tuberculosis of the other. This is visible in the next preparation which I will show, in which the disease is advanced on the right side and much less advanced on the left (VI, 21). This less affected kidney shows further two appearances which I have found in a number of cases, and which are very characteristic. One of these is that the tuberculosis is in the lower parts of the kidney. The infection has reached the kidney by the ureter and has gravitated to the inferior portions of the pelvis. The other condition is that of hydronephrosis, which this kidney shows to a considerable degree. This, which is due to obstruction of the ureter, is the consequence of curdy caseous matter becoming impacted in the orifice of the ureter at the bladder. I well remember the first time I observed this condition of hydronephrosis thus brought about. It was in my early days in the Royal Infirmary, and the preparations are preserved in the museum there as Series VII, Nos. 35 and 36. The case was that of a boy who was admitted with convulsions, and the story was that these had come on after a whipping at school. There was even some possibility of a prosecution of the schoolmaster. We found an advanced tuberculosis of one kidney and a serious hydronephrosis of the other. The ureter of the latter had become blocked with caseous matter and the hydro-

nephrosis was the consequence. The convulsions were really uræmic, and the relation to the castigation was merely that of coincidence.

The Testicle.—The testicle is an organ which is very frequently the seat of tuberculosis, either primarily or in consequence of propagation from the urinary tract. Healing may occur here in either of the two ways described. The testicle may discharge externally and, becoming emptied out, may contract and cicatrise. On the other hand, especially if the tuberculosis be limited, the necrosed matter may remain and be converted into a pultaceous material. This was the case in the testicle belonging to the case of partially healed tuberculosis of the kidney already shown. It will be seen that the epididymis is here represented by a cavity which was found filled with putty-like matter. All along the vas deferens in this case there were little chalky masses in the canal, and the vesiculæ seminales also contained similar chalky masses. The tuberculosis in these parts was extinct although active in the kidneys, in one of which it had found a fresh field.

The Peritoneum.—The last locality of healed tuberculosis to which I shall particularly refer is the peritoneum. Tuberculosis of the peritoneum is probably a somewhat frequent disease of children. It usually begins rather acutely and then becomes chronic. The chronic condition is characterised by a great new formation of connective tissue on the peritoneal surface which unites almost all the surfaces which are in contact. A *post-mortem* examination in such a case is a very disagreeable and troublesome operation. The whole intestine is matted together by firm adhesions which cannot be separated without tearing the intestine. The tuberculous character is shown by the presence of numbers, generally large numbers, of yellow caseous masses, dotted everywhere over the peritoneum and involved in the adhesions.

What should we expect here if healing should occur? We should expect the adhesions to remain, and the caseous masses either to be absorbed or converted into cretaceous or stony masses. This is precisely what has occurred in the preparation which I now show you (IV, 62A). Here is the description in the catalogue of the museum. The whole intestine is united by adhesions composed of delicate connective tissue, and similar adhesions unite the liver and spleen to the diaphragm and indeed almost obliterate the peritoneal cavity. In the midst of the adhesions there are occasional small masses of a gritty character, apparently old tuberculous masses. The history of this case was very interesting in this respect that ten years before death he was a patient in the Western Infirmary, where he was treated for tuberculous peritonitis.

I have another preparation of healed tuberculosis of the peritoneum, which shows the risks which may ensue after healing has occurred. The adhesion here has been much less general than in the other case, and bands of fibrous tissue have formed. There were a number of these bands, and there were also rounded cretaceous bodies in various parts of the peritoneum. One of the bands had become twisted round the intestines, producing a strangulation of one of the loops, which proved fatal.⁴ I do not know whether this is a frequent result of healed tuberculosis of the peritoneum, but I have seen at least three cases of it, and two of them occurred within the last year.

As to the remaining organs, I have nothing definite to say. I see no reason against the supposition that a tuberculosis of the brain, manifested by the presence of a caseous mass, may not be recovered from. I have never seen any evidence of this, but I have seen cases in which the advance of the disease had apparently ceased. That is to say, whereas in a growing tuberculous tumour there is always a grey active zone outside the caseous necrosed portion, I have sometimes seen this zone absent. Tuberculosis of the meninges, again, is common, especially in children. I have no evidence of recovery from it, but I believe that some have inferred from clinical observation that it may be. If it does occur, it must be very rare. I do not think tuberculous meningitis occurs as a primary disease; it is either propagated from some neighbouring locality, or is part of a general tuberculosis. In

⁴ The two cases of healed tuberculosis of the peritoneum from which the preparations shown were obtained have been published in detail in the *Glasgow Medical Journal*, November, 1889.

the latter case there can be no recovery; in the former there may possibly be a healing of both the primary and secondary affection, but it is not likely.

VI. STATISTICS OF HEALED TUBERCULOSIS.

I have gone over a considerable number of organs, and have illustrated how, in them, tuberculosis is recovered from. You may have inferred from the number of preparations shown, all of them taken from the museum of the Western Infirmary, that healing is not very uncommon. Any pathologist who observes carefully will tell you that such healed lesions are of very frequent occurrence. In order to put the matter to the test I have made a scrutiny of my records for ten months from October 31st, 1890, till September 1st, 1891. Some of the *post-mortem* examinations were only partial ones, and others were made in my absence, and special attention was not directed to this matter; subtracting these, we have 131 cases available in the ten months; of these, 28 were cases of active tuberculosis, and they are to be excluded for our present purpose. Of the remaining 103 there were evidences of healed tuberculosis in 24, or in over 23 per cent.

I may say that in estimating the presence of healed tuberculosis I went on the principles which I have been illustrating. In none of these cases was there in any organ an active tuberculosis, and tuberculosis did not apparently contribute to the cause of death. The evidences of former tuberculosis were always unequivocal. In the lungs there were always cicatrices containing in nearly every case cretaceous matter; in a few there were cavities; in other cases there were equally definite evidences of the lesion.

It may be interesting to give a brief analysis of these cases in certain aspects. As to the forms of tuberculosis, 20 out of the 24 were cases of healed tuberculosis of the lungs. Of the remaining 4, 2 were cases of healed tuberculosis of the peritoneum, 1 of the mesenteric glands, and 1 of the bronchial glands. I may add that the 2 cases of peritoneal tuberculosis both ended in strangulation of the intestine by the adhesions, but neither of them is that from which the preparation already shown was obtained.

The ages of the persons who presented evidences of healed tuberculosis is a matter of some interest. I have constructed a table from the *post-mortem* records already referred to, showing the ages of the cases of active tuberculosis, of healed tuberculosis, and of other cases. In the latter category there are only 70 cases, instead of 79, as the ages of 9 of the cases were not obtainable.

I. Ages at Death in cases of Active Tuberculosis, Healed Tuberculosis, and Other Cases.

Ages.	Active Tuberculosis.		Healed Tuberculosis.		Other Cases.	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
0 to 29	12	43	2	8.5	11	15.75
30 to 39	6	21.5	5	20.75	13	18.5
40 to 49	6	21.5	5	20.75	20	28.75
50 to 59	—	—	8	33.5	13	18.5
60 to 69	4	14	4	16.5	10	14.3
70	—	—	—	—	3	4.2
Under 40	18	64.5	7	29.25	24	34.25
Over 40	10	35.5	17	70.75	46	65.75
Totals	28	—	24	—	70	—

It will be seen from these tables that the ages of death in the cases of healed tuberculosis approximate somewhat closely to those in the other cases, but, if anything, are a little higher. Thus there are only 29.0 per cent. of the former under 40, while there are 34 per cent. of the latter. It will be noticed that in the cases of active tuberculosis the order is nearly inverted, those under 40 being 64.5, and over 40, 35.5.

It may be further of some interest to note the causes of death in our 24 cases of healed tuberculosis, and to compare these with the causes of death in the 79 other cases. I shall embody in another table the causes of death in the two classes of cases.

II. Causes of Death in Healed Tuberculosis and Other Cases.

Disease.	Healed Tuberculosis.		Other Cases.	
	No.	Per Cent.	No.	Per Cent.
Bronchitis and emphysema	1	4.3	4	5
Gangrene of lung	4	16.6	3	3.75
Pneumonia	2	8.3	4	5
Heart disease	4	16.6	17	21.5
Cancer	4	16.6	14	18
Cerebral disease	2	8.3	6	7.5
Intestinal obstruction	2	8.3	1	1.25
Hernia	0	—	3	3.75
Chronic nephritis	3	12.5	1	1.25
Pernicious anaemia	0	—	4	5
Syphilis	0	—	4	5
Other diseases	2	8.3	18	23

I do not know that there is much to be said in regard to this table, but one or two points call for a moment's notice. If any weight can be attached to such small figures, then, perhaps, the most noteworthy fact is the frequency of gangrene of the lung in the cases of healed tuberculosis. One can understand that a lung where blood vessels have been interfered with by the processes of necrosis and subsequent cicatrization might be less resistant in acute inflammatory disease than a normal lung. It does look remarkable that a condition so relatively uncommon as gangrene of the lung should occur in 4 cases out of the 24.

In regard to cancer, it will be noted that it occurs in about the same proportion in the cases of healed tuberculosis as in the general cases. This rather contradicts the general impression that cancer and tuberculosis are in some measure incompatible—an impression which, on other grounds, I regard as erroneous.

The only other exceptional proportion is that of chronic nephritis. There were 3 cases of chronic Bright's disease in the 24. This may be merely a coincidence, and I have no suggestion to offer as regards a possible explanation of it.

Before leaving this part of my subject, I have, merely in a word, to refer to a very excellent paper by Dr. Harris, of Manchester, published in the *BRITISH MEDICAL JOURNAL* for 1889, ii, 1385. It is headed "The Curability of Phthisis." This author, on the basis of the *post-mortems*, extending over a year, in the Manchester Infirmary, comes to conclusions very similar to my own, but he places the percentage somewhat higher than I do. My cases give 23 per cent., and they include 4 cases of tuberculosis in other parts than in the lungs. Dr. Harris's observations apply only to the lungs, and give 38 per cent. of what he calls involuted tuberculosis. Perhaps the explanation of this difference is to be found, partly at least, in the difference of the object in view. Dr. Harris looked for evidences of involuted tuberculosis, and accepted them, even if the person had died from or with active tuberculosis. This is shown by the fact that he includes 4 cases of phthisis in his 54 cases. He also states that in some of his cases microscopic examination showed that the tuberculosis, although apparently latent to the naked eye, was still active. In all my cases the patient died from some cause altogether apart from tuberculosis, and the evidences were such as to make it a simple matter of fact that the tuberculosis had been completely recovered from.

VII. HEALING IN ONE LOCALITY AND EXTENSION IN ANOTHER.

There is still one matter to which I desire to call attention before concluding this address. I have already referred to the fact that tuberculosis may exhaust itself and become extinct in one place, but may extend from this original position and remain active in other parts. I want to illustrate this somewhat further and point out one or two practical deductions.

This preparation (III, 28b) could not be included in my list of healed tuberculosis because the patient died of tuberculosis, but it shows a healed lesion. It is a portion of the lung containing a large cavity 2 inches in diameter. It comes very

close to the surface of the lung, and is closely surrounded, as you will see, by sound lung tissue. There is no active tuberculosis in the wall or immediately around. This is a healed cavity, absolutely without action. Besides this old lesion there was another small cavity, as well as cicatrices and cretaceous matter in other parts of this lung, and there were cicatrices and cretaceous matter in the other lung. While this was the case, there were scattered throughout both lungs the lesions of a recent acute tuberculosis, without any softening or formation of cavities. Looking closely at the preparation you can see these scattered nodules on the cut surface. The explanation of this recent tuberculosis was to be found in a tuberculous ulceration of the larynx, and the case is illustrative of a class which I believe to be a numerous one. I am constantly meeting with cases in which an old and perhaps a healed tuberculosis of the lung is associated with a recent active tuberculosis without any intermediate stage. There are only these two widely separate stages of the disease. The explanation is generally to be found in a tuberculosis of the larynx.

My belief, as the result of considerable observation, is that a tuberculosis of the lungs, sometimes of inconsiderable extent, will often extend to the larynx, perhaps there also of little consequence for a time. The disease may be recovered from in the lung while it lingers on in the larynx. After a long course in the larynx—as long sometimes as four or five years—a reinfection of the lung may take place. This will occur when the laryngeal lesion becomes extensively ulcerated. The discharges from such ulcers are highly infective, they are loaded with bacilli. It is not to be supposed that the bacilli rise from the ulcers into the air as dust, and are either expired or inspired as such, but in the processes of respiration little fragments of mucus are liable to be carried in and planted in the finer bronchi. In consequence there is a sudden burst of acute tuberculosis to which the patient probably succumbs. In such cases the tuberculosis may be scattered somewhat homogeneously throughout the lungs, or it may be—as I have sometimes seen it—mainly in the central parts, involving the upper parts of the lower lobe and the lower parts of the upper. At any rate, there is no such proclivity to the apex as in ordinary phthisis.

The history of the case before us is illustrative of this class of cases. The patient, a man aged 42, was ill two years before death with cough, spit, and hæmoptysis. The illness was not regarded as serious, and it was accompanied by a bulging of the chest in the left front—a bulging which turned out to be from the cavity shown in the preparation. He recovered from this illness, and was apparently well till six months before death, when pronounced laryngeal symptoms occurred and acute pulmonary phthisis followed. Although there is here no record of laryngeal symptoms in the period between the two illnesses, I think we may infer that the tuberculosis lingered on, and that there was a hoarseness of the voice which the patient thought of no consequence.

The practical inference from this class of cases is that, after a pulmonary attack, even if of a slight nature, a remaining laryngeal disturbance should not be regarded as of trivial importance.

I ought to add that ulceration occurring in the trachea and larger bronchi may produce a somewhat similar reinfection of the lungs, giving rise to the same widely diverging stages of the disease.

What we find in the respiratory organs is sometimes visible elsewhere. We have seen how a tuberculosis of the testicle may travel to the kidneys, and while entirely retrograde in its original seat, may go on advancing in the more recent situation. This was the case in one of the preparations already shown (new preparation, No. 9).

In another of the preparations (IA, 25) we see a healing of the vertebrae, with collapse of two of the bodies, going along with considerable erosion of other bodies from without. The primary seat inside the bone has been evacuated by the emptying out of the necrosed structures, and the disease has been attacking neighbouring structures. In this case the tuberculosis had extended from the local seat to the membranes of the brain and to the blood, there being a tuberculous meningitis and general tuberculosis. The remarkable thing is that the tuberculosis of the vertebrae, which must have lasted for years, seems not to have been suspected during life.

Gentlemen, I have detained you too long. I trust that, as the result of my remarks, you will look more hopefully on tuberculosis as amenable to cure. If about a quarter of the people who die of other diseases show evidences of having been tuberculous, then recovery is not very uncommon.

In all my remarks I have assumed the standpoint of tuberculosis as an infectious disease. This is now the unalterable position of all pathologists. I must say that I see little trace as yet of this attitude on the part of the practitioner and the general public. As I have given expression to my views on this subject in a recent address at the Sanitary Congress in Edinburgh, I will not further expand them here. I should like, however, that the profession would seriously look into their practice in view of the discovery of the tubercle bacillus, and I should favour a discussion on the subject in this Society.

[The preparations referred to in the text are in the museum of the Western Infirmary and are described in the catalogue under the numbers quoted.]

REMARKS ON ARRESTED PULMONARY TUBERCULOSIS,¹

*In the Section of Pathology at the Annual Meeting of the
British Medical Association held at Bournemouth,
July, 1891.*

J. K. FOWLER, M.A., M.D., F.R.C.P.,

Senior Assistant Physician to the Middlesex Hospital and Lecturer on
Pathological Anatomy; Senior Assistant Physician to the
Hospital for Consumption and Diseases
of the Chest, Brompton.

WHEN I was invited to open a discussion in the Section of Pathology, the subject of tuberculous disease of the lungs seemed naturally to suggest itself as likely to be of interest to those who would meet at Bournemouth. From the programmes of the Sections of Medicine and Therapeutics, it is obvious that the same idea has occurred to others similarly situated; but in this I see no disadvantage; on the contrary, we may well hope that the discussion of so important a subject from various standpoints may serve to bring out clearly the present clinical and pathological conceptions of the disease generally known as "phthisis pulmonalis."

Recent events have certainly rendered it more than ever desirable that our views of the pathology of "phthisis" should be in accord with the results of scientific research, and that our knowledge of the natural history of pulmonary tuberculosis should be accurate, for a false pathology cannot but act as a bar to progress in therapeutics, and ignorance of the course of a disease may lead us to ascribe to remedies results which have been brought about by the unaided resources of Nature. The pathology of phthisis is a well worn subject, and I do not propose to occupy much of your time by its discussion, but some reference must be made to it as a preliminary to a consideration of the arrest of pulmonary tuberculosis, with which we are to-day more immediately concerned.

The discovery of the tubercle bacillus, followed by the proof of its pathogenic properties, has, I imagine, so far as most pathologists are concerned, set at rest the vexed question as to the nature of tubercle, and has at the same time gone far to determine their views as to the pathology of phthisis.

The position of those who hold that phthisis is but one disease, and that it is the result of a tuberculous infection of the lungs, has thus been materially strengthened, and the time has come when we may fairly ask those who still maintain the contrary opinion to bring forward the evidence on which their belief is founded.

One of the chief grounds urged against the acceptance of the above view is the great variety in the lesions of phthisis, and the undoubted fact that in the production of some of them inflammation plays an important part. It is true that

¹ The paper was illustrated by four series of cases; brief abstracts were presented to members attending the Section.